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Mr. JOSEPH POPE's description of an Orrery of his construction.

AS the number of appearances, explained by an Orrery, depends upon the number and exactness of its motions, the following description of the performances of the Orrery completed by me in the year 1788, will shew its utility.

On the large circle of this machine, representing the ecliptic, are engraven the signs and degrees of the Zodiac, with the days and months of the year ; in the centre of which, is a brass ball, representing the SUN, turning on its axis, in $25\frac{1}{4}$ diurnal rotations of the earth ; its axis declines from the axis of the ecliptic circle, 8 degrees, and its north pole tends towards the 8th degree of Pisces.

The planets represented by ivory balls, are as near their relative diameters and distances as the convenience of the machine will permit ; they revolve round the sun in their various eccentric and inclined orbits. Mercury, the nearest to the Sun, being the first in order, with his axis perpendicular to the ecliptic, performs his motion round the Sun in $87\frac{1}{4}$ diurnal rotations of the earth, or in 87 days, 23 hours.

The next is Venus, she performs her annual course in 224 days 17 hours, of our time, and her diurnal motion, in 23 days 8 hours ; her axis declines 75 degrees from that of the ecliptic, keeping parallel to itself ; the North Pole tends towards the 20th degree of Aquarius.

The

The next to Venus is our Earth, half covered with a black cap, which is always in opposition to the Sun. She makes $365\frac{1}{4}$ diurnal rotations on her axis in the same time she performs her annual revolution : her axis declines from that of the ecliptic, 23 degrees 29 minutes, preserving its parallelism round the Sun ; her north pole tends towards the first degree of Cancer. The Moon, accompanying the Earth, performs her periodical revolution in 27 days, 7 hours, 43 minutes, turning on her axis exactly once in the same time, and performing her synodical revolution, or from sun to sun, in 29 days, 12 hours, 45 minutes. On the circle representing her orbit are marked the nodes and degrees of her north and south latitudes, the plane of which forms an angle of 5 degrees with the plane of the ecliptic ; the nodes have their back motions passing through all the signs and degrees in $18\frac{1}{2}$ years. There is another body, half covered with a black cap, which at all times shews its dark part ; it turns on its axis, which declines from the axis of the ecliptic and keeps parallel to itself round the earth ; it exhibits all the phenomena explained by the above moon.

Mars is without the earth's orbit, with his axis perpendicular to the ecliptic, performing his annual motion in $686\frac{1}{2}$ days, and diurnal in 24 hours, 40 minutes.

Jupiter is at a greater distance from the Sun than Mars, with his axis perpendicular to the ecliptic, completing his annual circuit in 11 years, and 314 days, 18 hours, and his diurnal motion in 9 hours, 56 minutes.

Saturn,

Saturn, the most distant from the sun of all the planets in the machine, with his axis perpendicular to the ecliptic, performs his annual course in 29 years, 167 days, 1 hour.

The Satellites of Jupiter and Saturn, at their different distances, nearly in true time, revolve round their primaries; the one most remote from Jupiter revolves in its inclined orbit; the orbits of the other three are coincident with the plane of the ecliptic. Saturn's five satellites,* in their revolutions, keep in the plane of his ring, which forms an angle with the plane of the ecliptic of 30 degrees, and preserves its parallelism round the Sun.

There are two dial plates, one shewing the common, the other the sidereal time; also several other pieces, which may be applied occasionally, viz. a small horizon circle, semi-circle, solar ray, &c. The whole machine is put in motion by the turn of a single winch.

JOSEPH POPE.

November 12, 1794.

* Mr. Pope's Orrery was constructed, and this account of it prepared, before Dr. Herschel's discovery of the two additional satellites of Saturn was announced.